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The Four-Way Interactions among Host Plant-Whitefly-Virus-Endosymbionts in Insect and Disease Development

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Abstract : The whitefly, Bemisia tabaci (Gennadius) (Hemiptera; Aleyrodidae) is a highly polyphagous pest reported to infest over 600 plant hosts globally. About 42 genetic groups/cryptic species of B. tabaci exist in the world on different hosts. The species have variable behaviour with respect to feeding, development and transmission of viral diseases. Feeding on diverse host plants affect both whitefly development and the population of the endosymbionts harboured by the insects. Due to changes in the level of endosymbionts, the virus transmission efficiency by the vector also gets affected. We investigated these interactions on five host plants – egg plant, tomato, beans, okra and cotton - using a single whitefly species Asia 1 infected with three different bacteria Portiera, Wolbachia and Arsenophonus. The Asia 1 transmits the Tomato leaf curl Bangalore virus (ToLCBV) effectively and thus was used in the interaction studies. We found a significant impact of hosts on whitefly growth and development; eggplant was most favourable host, while okra and tomato were least favourable. Among the endosymbiotic bacteria, the titre of Wolbachia was significantly affected by feeding of B. tabaci on different host plants whereas Arsenophonus and Portiera were unaffected. When whitefly fed on ToLCBV-infected tomato plants, the Arsenophonus population was significantly increased, indicating its previously confirmed role in ToLCBV transmission. Further, screening of total proteins of B. tabaci Asia 1 genetic group interacting with ToLCBV coat protein was carried out using Y2H system. Some of the proteins found to be interacting with ToLCBV CP were HSPs 70kDa, GroEL, nucleoproteins, vitellogenins, apolipophorins, lachesins, enolase. The reported protein thus would be the potential targets for novel whitefly control strategies such as RNAi or novel insecticide target sites for sustainable whitefly management after confirmation of genuine proteins.

Keywords : cDNA, whitefly, ToLCBV, endosymbionts, Y2H
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